Claims

1. A method of sputtering a tungsten or tungsten-containing film from a tungsten target onto a semiconductor wafer including using krypton or xenon as a sputter gas.

2. A method as claimed in claim 1 wherein the deposition takes place in a vacuum chamber with a krypton pressure of less than 10mT.

3. A method as claimed in claim 2 wherein krypton pressure is less than 6mT.

4. A method as claimed in any one of claim 1 to 3 wherein the resistivity of the tungsten film is less than 11μohm cm.

5. A method as claimed in any one of the preceding claims wherein the power supplied to the target is greater than about 1 watt per cm.

6. A method as claimed in any one of the preceding claims wherein the wafer is placed on a platen during deposition and the platen temperature is between 200°C and 400°C.

7. A method as claimed in any one of the preceding claims wherein the platen is negatively DC biased.

8. A method as claimed in claim 1 wherein the sputtering is reactive sputtering; the sputter gases includes nitrogen and the film deposited is tungsten nitride.

9. A method as claimed in claims 1 to 8 wherein the sputter gasses further include argon.

10. A method as claimed in claim 9 wherein the ratio of argon to krypton or xenon is selected to minimise stress in the deposited film.

11. A method of forming a tungsten/tungsten nitride stack on a wafer including sputtering a tungsten nitride film on a wafer and sputtering a tungsten film on the tungsten/nitride film wherein the two sputtering processes are performed in a single chamber using a single target.

12. A method as claimed in claim 11 wherein the wafer is on a platen and the platen temperature is maintained substantially the same for the two sputter processes.

13. A method as claimed in claim 10 or claim 11 wherein the tungsten film is sputtered using a method as claimed in any one of the claims 1 to 7.

14. A method as claimed in any one of claim 11 to 13 wherein the tungsten or tungsten containing film is deposited using the method of claims 8 to 10.

15. A gate structure formed by the methods of any one of claims 11 to 14.